



**2018 JOINT GOVERNMENT  
WATER QUALITY CONFERENCE  
LIHUE, KAUAI  
AUGUST 2, 2018**



# **INTERAGENCY COLLABORATIONS: ASSESSING PESTICIDE OCCURRENCE AND DISTRIBUTION IN HAWAII**

**FENIX GRANGE  
HAZARD EVALUATION AND EMERGENCY RESPONSE OFFICE  
HAWAII STATE DEPARTMENT OF HEALTH**

# A Little History



Public debate, County regulations, lawsuits, conflicts and widely differing perceptions about impacts of large agribusiness seed operations on health of local communities and ecosystems.

Are currently used pesticides moving off site at levels of concern?

CWB surface water monitoring program does not include currently used pesticides

# USGS Studies on Oahu



## Ground-Water Quality and its Relation to Land Use on Oahu, Hawaii, 2000–01

U.S. Department of the Interior  
U.S. Geological Survey  
Water-Resources Investigations Report 03-4305



Distribution of volatile organic compound mixtures in ground water.

NATIONAL WATER-QUALITY ASSESSMENT PROGRAM



## Water Quality on the Island of Oahu Hawaii, 1999–2001



U.S. Department of the Interior  
U.S. Geological Survey

Circular 1239

# USGS Studies on Oahu



Study on Oahu in 2000-2001 showed a clear connection between land use and pesticide detections in streams and ground water

Urban areas and agricultural areas had very different “fingerprints”

Residues of pesticides used on sugar cane, pineapple and golf courses detected in ground water and surface water

Multiple household pesticides detected in urban streams



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# Initial Collaboration 2013



Sharing expertise and digging up resources

- DOH HEER Office and Clean Water Branch \$25K
  - Department of Agriculture \$25K
- USGS Training, Technical Support and Laboratory Analyses \$45K in kind



- 2013-14 Statewide WQ Snapshot Pilot Study

# 2013-14 Pilot Study Design



- 24 locations
- Compared land uses with differing pesticide uses
- Small perennial streams or water bodies
- Winter sampling, dry period
- One time “snapshot” sampling– not representative of average conditions or other times of year
- Looked for broad range of currently used pesticides– 136 different compounds in water, 121 in sediments
- Very low detection limits

# Key Findings Statewide



- Atrazine in 23 of 24 locations tested
- Lots of trace level detections, few near benchmarks
- No currently used pesticide exceeded water quality standards
- No currently used pesticide exceeded drinking water standards.
- Clear land use fingerprints
- Urban streams and large agriculture

# Pilot Study Data Gaps and Findings



- Snapshot approach affected comparability and lack assessment of impacts over time
- Flow conditions not considered
- Sampling did not consider application periods
- Lack of perennial streams/suitable sites for key ag areas on Oahu and Maui
- Limited glyphosate sampling detected widespread, low concentrations - ubiquitous, but not a risk
- Sediment data less helpful than water samples

# Evolution 2015 -18



- DOH & DOA chose ongoing collaboration
- Kauai Joint Fact Finding Group expanded focus
- 2016 & 2017 Legislatures funded work through 2019
- Expanded WQ partnership
  - USGS experts: primary study design, mgmt and field ops
  - DOA Pesticides provides focus areas, pesticides of concern
  - HEER provides toxicology and study design assistance
- Trends by site, land use, flow conditions, pesticide regs
- Follow up sampling where exceedances occur
  - ✓ Add assessments over time





# Pesticide-Monitoring Program of Surface Waters in the State of Hawai'i

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Steve Anthony, Director  
USGS Pacific Islands Water Science Center

Briefing to the Hawai'i State Legislature  
December 11, 2017

U.S. Department of the Interior  
U.S. Geological Survey



# USGS Water Mission

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- Provide information to manage, protect, and enhance water resources
- Address water-related hazards
- Non-regulatory role
- Provide publicly accessible information that is actionable, reliable, impartial, and timely

# Program Objectives and Initial Scope

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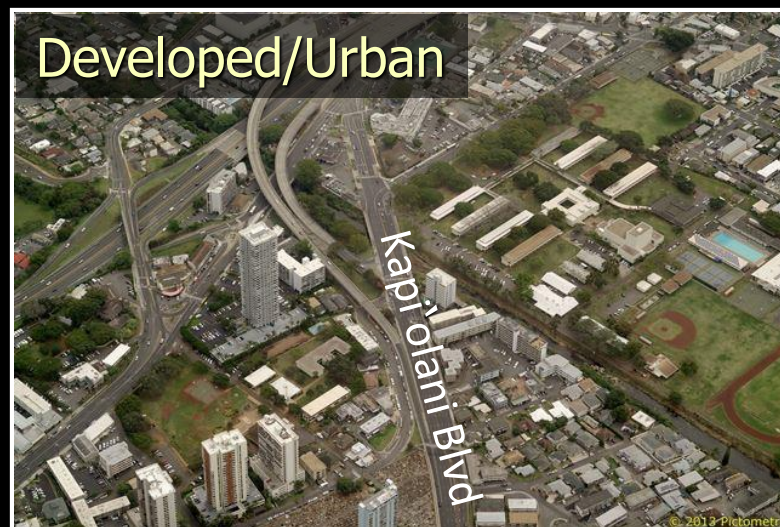
- Collaborative effort with HDOA and HDOH
- Assess the occurrence and distribution of current-use pesticides in surface water in Hawai'i
- Collect water samples at targeted sites on Kaua'i and O'ahu, and eventually other islands, using nationally consistent protocols
- Provide quality-assured sample results to HDOA and public through USGS online data repository
- Compare results to established Federal and State human-health and aquatic-life benchmarks



# Program Objectives and Initial Scope—cont.



Collect samples at targeted sites that receive runoff from different types of land uses





# Program Objectives and Initial Scope—cont.

Collect samples during different flow conditions



# 2017 Samples Collected at 35 Sites

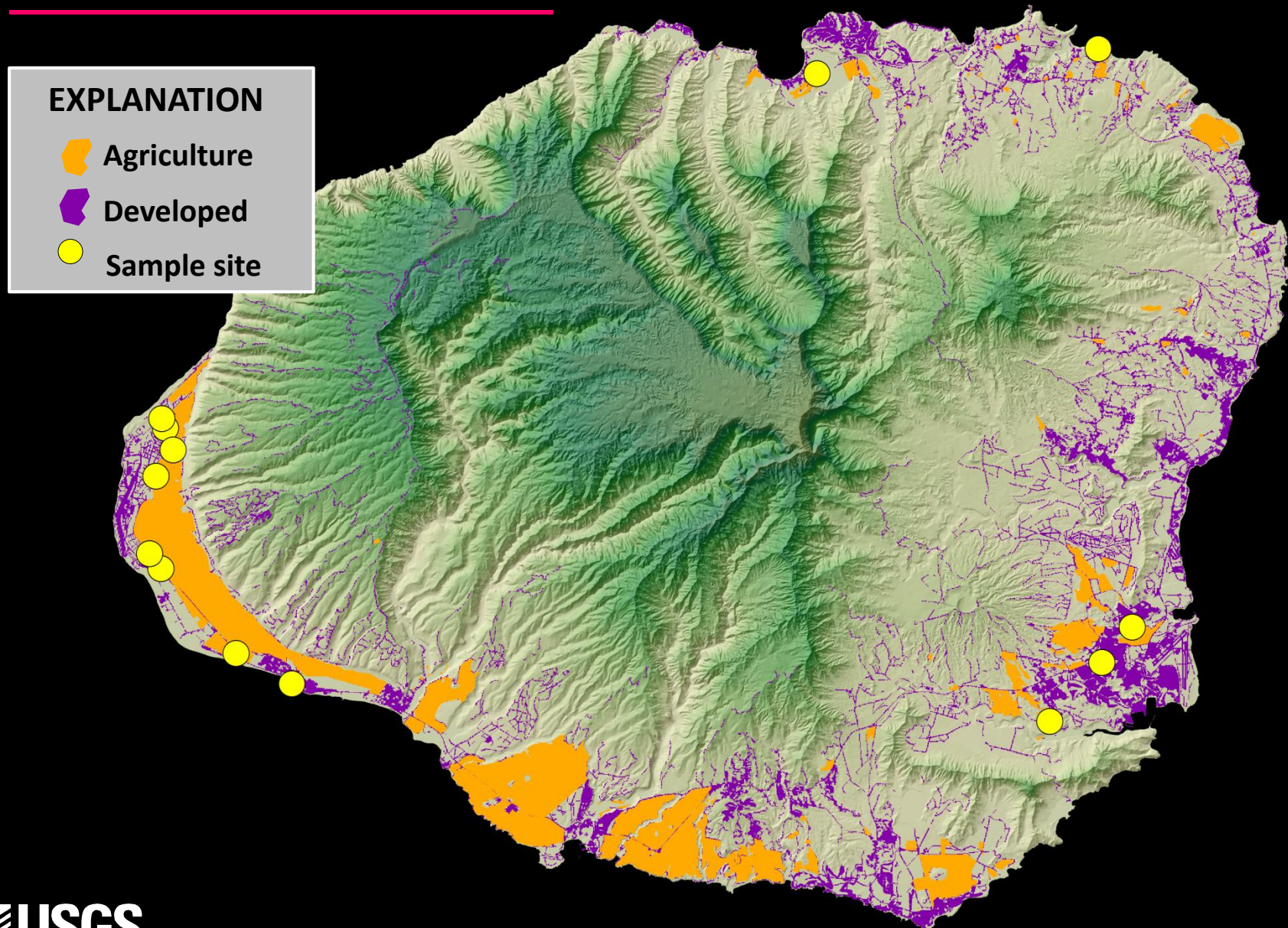
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- 13 sites on Kauaʻi and 22 sites on Oʻahu
- Streams, ditches, a wetland, and coastal ocean
- Downstream or nearby areas with:
  - Agriculture (16 sites)
  - Developed/Urban land use (6 sites)
  - Mixture of agriculture and developed (13 sites)



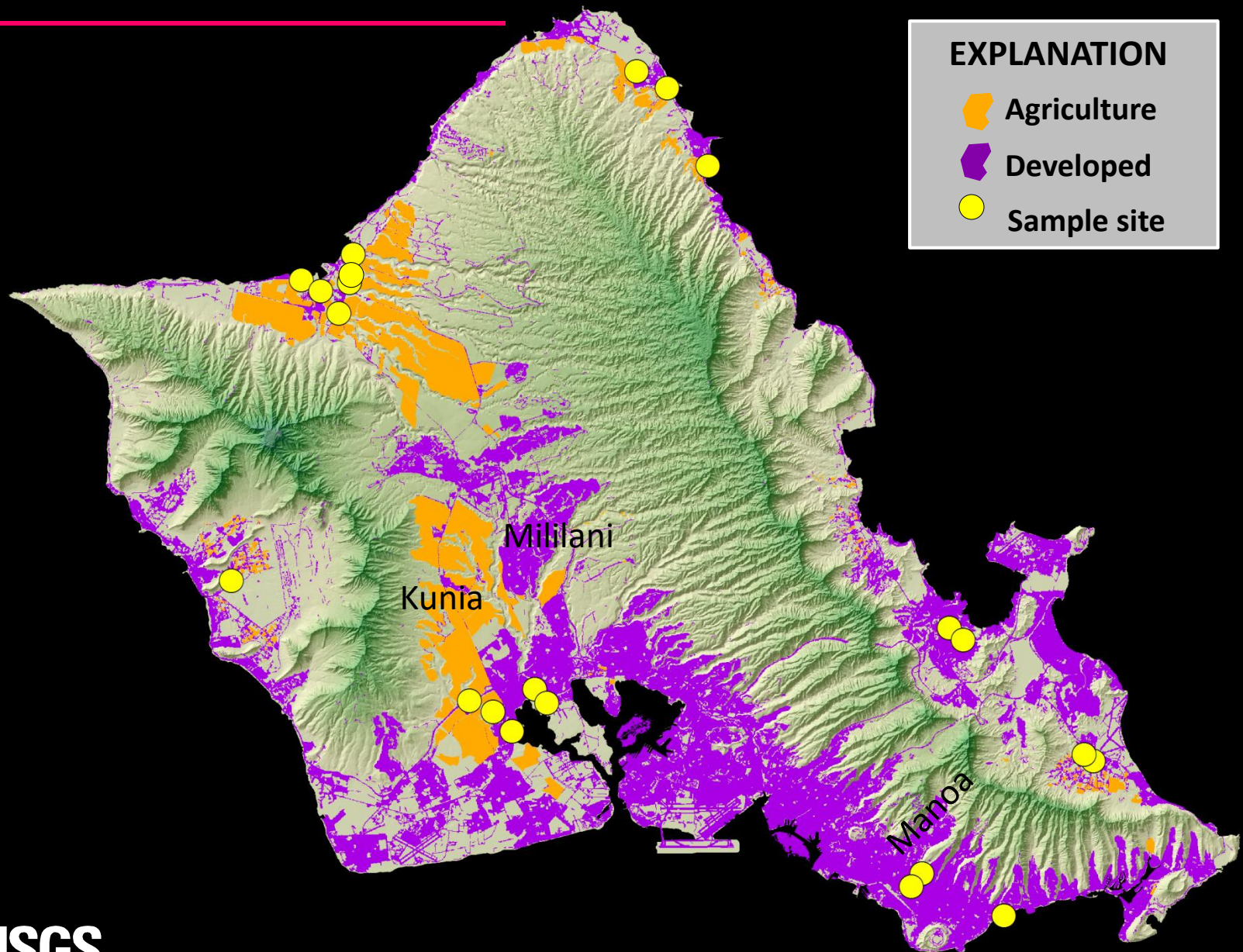
# 13 Sites on Kauaʻi

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# 22 Sites on O'ahu



# 51 Samples Collected

32 discrete samples

- 14 high flow
- 18 low flow



12 accumulation  
samplers  
(passive samplers)



7 quality-control  
samples

- blanks
- replicates
- spikes





# Laboratory Analyses for Pesticides

- Samples analyzed at USGS National Water-Quality Laboratory
- 225 current-use pesticides
  - 123 herbicides
  - 87 insecticides
  - 15 fungicides
- Pesticides can be detected at trace levels (parts per trillion), commonly 10 to 10,000 times lower than human-health and aquatic-life benchmarks

1 part per trillion =  
~1 water drop in 12 of these:



# 2017 Findings

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- Most samples contained a mixture of multiple pesticides
  - 0 to 33 pesticides detected per discrete sample
  - 2 to 51 pesticides detected per accumulation sampler
  - 37 pesticides and 24 pesticide degradates were detected at least once
- Concentrations of detected pesticides were low:
  - All were below current human-health benchmarks
  - Nearly all were below current aquatic-life benchmarks
  - Fipronil detected in 100% of developed land use category sites -- use as a termiticide and pet treatment
- Note: Some detected pesticides have no human-health or aquatic-life benchmarks

# 2017 Findings of Interest to Kauai



## Restricted Use Pesticides

- Chlorpyrifos and metolachlor
  - None detected on Kauai in 2017
  - 2 chlorpyrifos high flow hits at one site on Oahu
- Atrazine (parent) seen in low flow samples only
  - Detected at low concentrations in 2 samples on Kauai
  - 3/32 samples total in 2017, vs. 18/24 samples in 2013-14
  - Detections 100X lower than MCL and strictest aquatic life benchmarks. Likely related to drop in sales and use
  - Degradates still frequently detected
- 2017 Kauai samples did not capture storm events

Johnson, A.G. and Kennedy, J.J., 2018, Summary of dissolved pesticide concentrations in discrete surface-water samples collected on the islands of Kaua'i and O'ahu, Hawai'i, November 2016–April 2017: U.S. Geological Survey data release, <https://doi.org/10.5066/F7BG2N79>.



# 2017 Findings

## Number of pesticide detections by use group and flow condition

245 detections total, out of 7,200 pesticide-compound results from laboratory

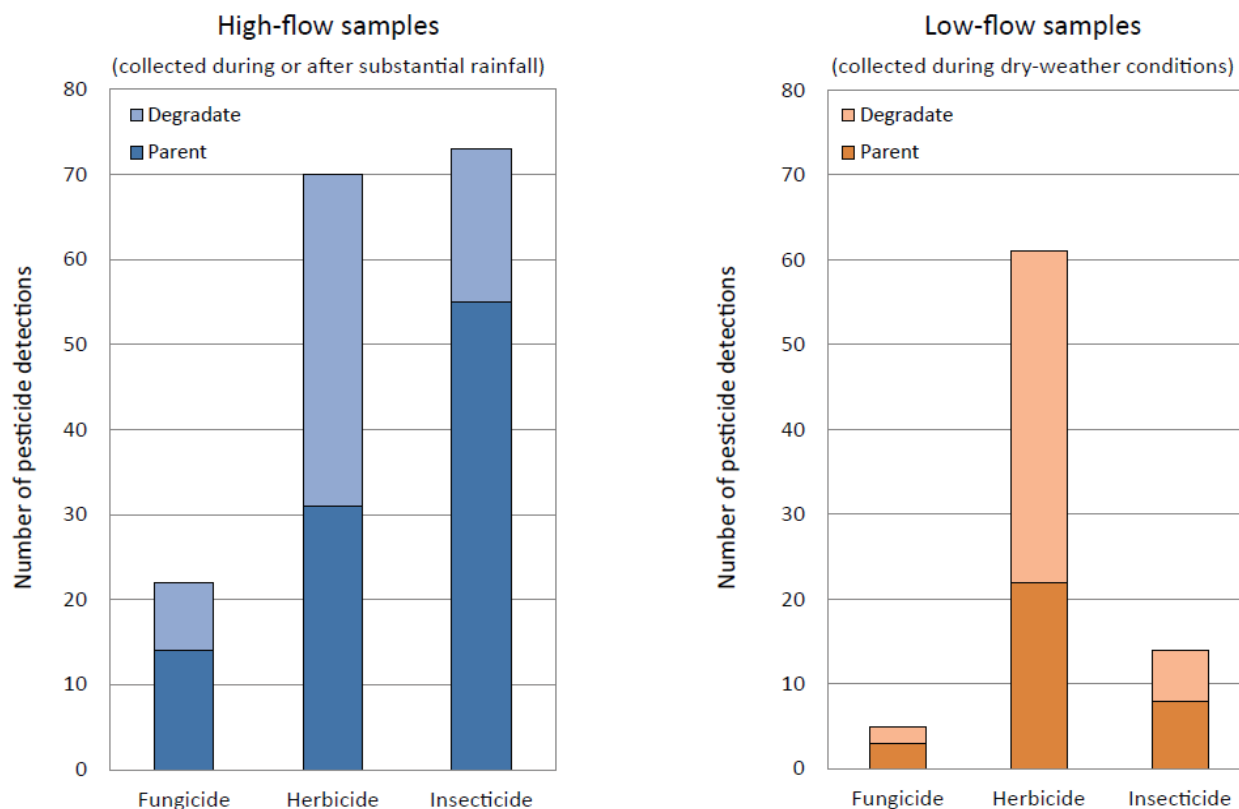


Figure 4. Number of pesticides detected by use group and flow condition in all 32 discrete water samples collected on Kaua'i and O'ahu, Hawai'i, between November 2016 and April 2017.

# 2017 Findings

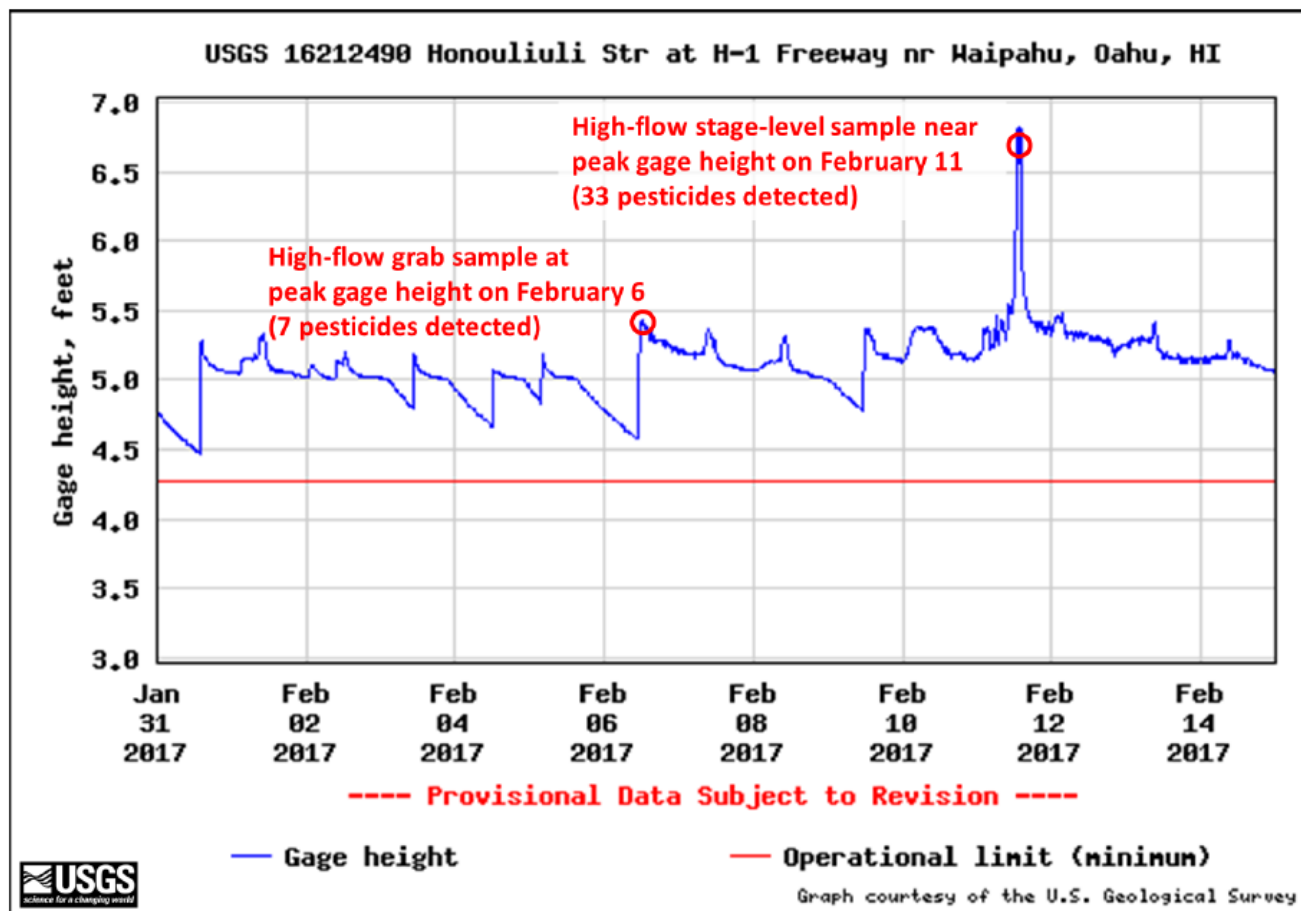


Figure 11. Graph of gage height (stream stage) measured at Honouliuli Stream at H-1 Freeway near Waipahu, O'ahu, Hawai'i (site 16212490) when high-flow samples were collected on February 6 and 11, 2017.



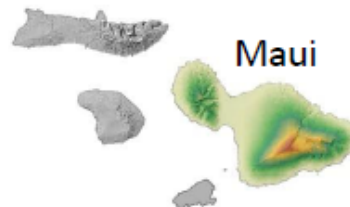
# Pesticide-Monitoring Program of Surface Water in Hawai'i: January- February 2018 Update for the Islands of Kaua'i, O'ahu and Maui



Kaua'i

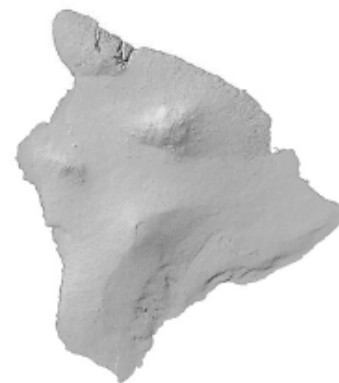


O'ahu



Maui

DRAFT



**Joseph Kennedy**

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**USGS Pacific Islands Water Science Center**

**Pesticide-Monitoring Program Update Meeting**

**July 19, 2018**

U.S. Department of the Interior  
U.S. Geological Survey

# Early 2018 Storm Sampling Completed

## Kaua'i

- 8 storm samples and 1 dry-weather samples



Compare flow conditions

## O'ahu

- 2 storm samples ( adds to 2017 storm data set)



Add assessments over time

## Maui

- 11 storm samples



Collect storm data in absence of perennial streams

# West Kaua'i

Storm samples collected  
Feb 2, 2018

Unnamed Ditch 1

Unnamed Ditch 3

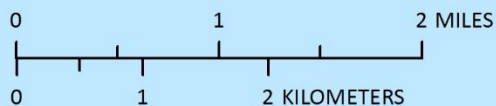
Unnamed Ditch 2

Unnamed Ditch 4

Unnamed Ditch at Hwy 50

## Explanation

- Storm sample
- ~ Stream
- Developed
- Aquaculture
- Diversified agriculture
- Seed production





Unnamed Ditch at Hwy 50,  
near Kekaha, Kaua'i, Feb 2, 2018







Unnamed Ditch 1 near  
Kekaha, Kaua'i, Feb 2, 2018.



Weighted bottle holder used to  
collect water-quality samples  
from bridges.

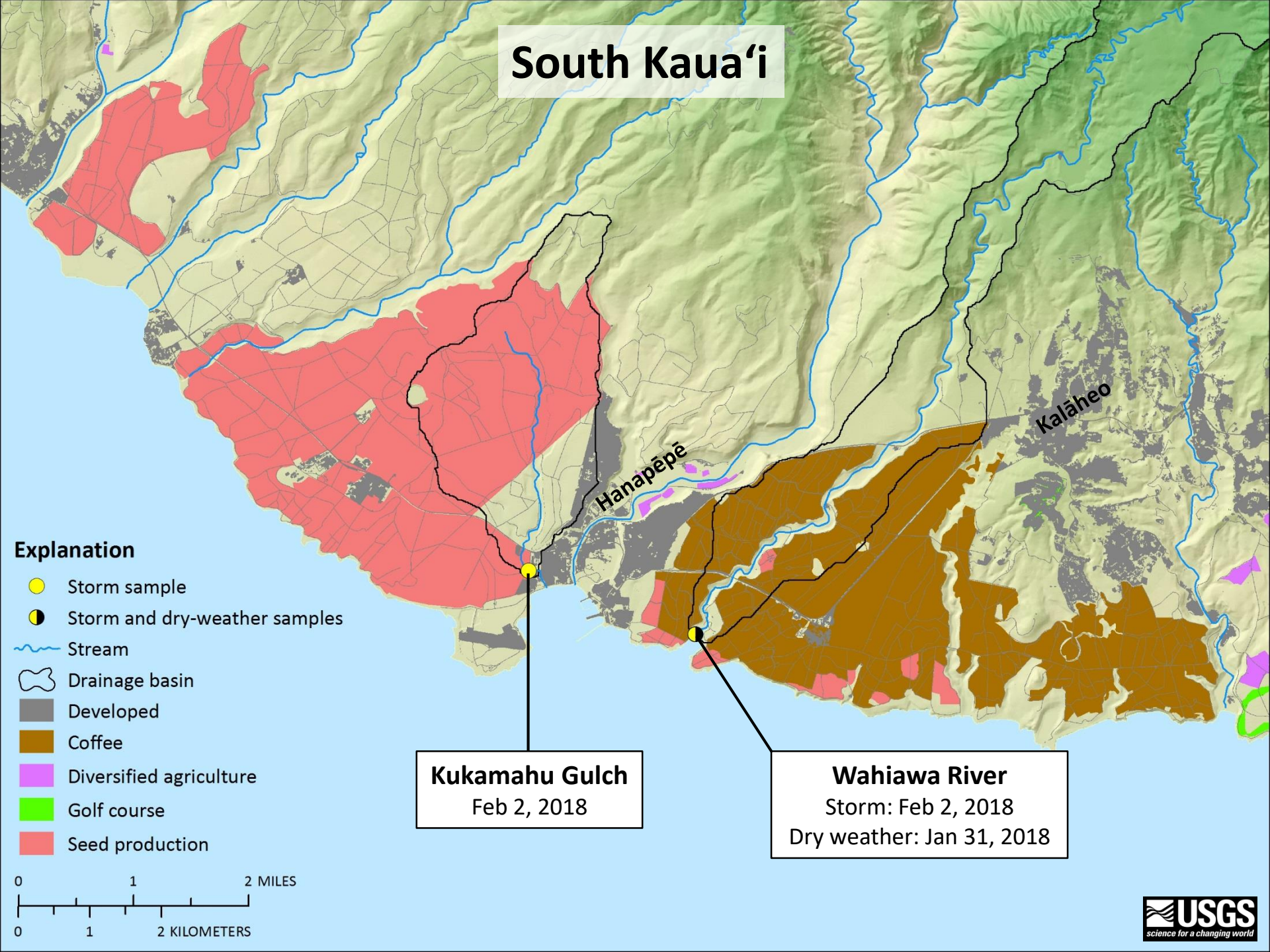


Unnamed Ditch 4 near  
Kekaha, Kaua'i, Feb 2, 2018





# South Kauaʻi





Retrieving water from stage-level  
sampler in Kukamahu Gulch near  
Hanapēpē, Kauaʻi, Feb 2, 2018





# Comparison of Water Level During Dry-Weather and Storm Conditions at Wahiawa River



Jan 31, 2018



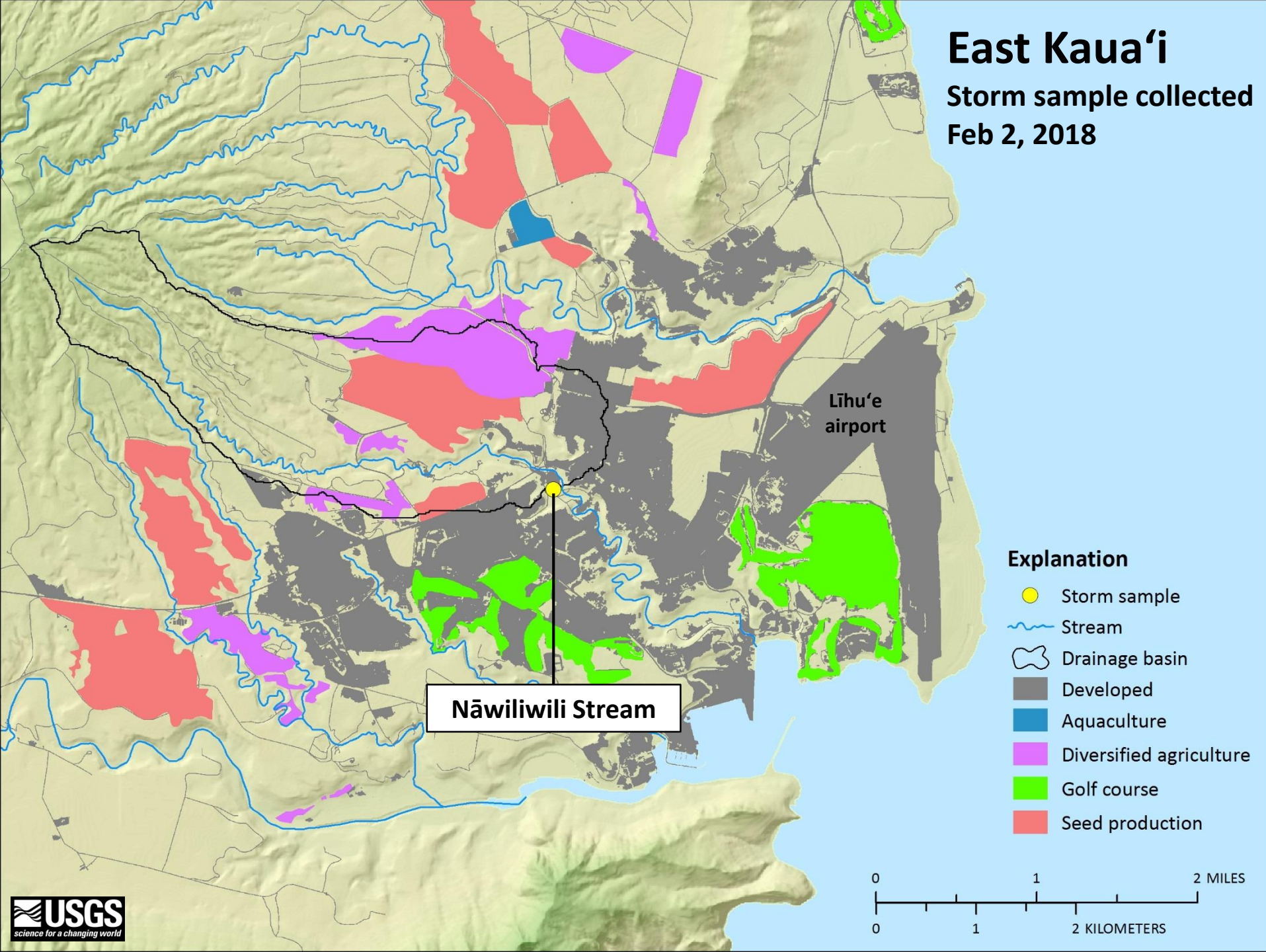
Feb 2, 2018

Preliminary Information-Subject to Revision. Not for Citation or Distribution



# East Kaua'i

Storm sample collected  
Feb 2, 2018







Stage-level sampler deployed at Nāwiliwili Stream, near Līhu'e, Kaua'i, Dec 7, 2017



# Next steps

## **Analyze pending results for dry-weather samples collected at**

- 15 sites on Big Island in June 2018
- 5 sites on Maui in May 2018
- 15 sites on O'ahu in May and July 2018

## **Complete initial (phase 1) sampling at each targeted site**

- Get a dry-weather sample if water is present and is mostly fresh
- Get a storm sample if possible
- Deploy passive sampler if feasible and logical

## **Continue follow-up (phase 2) sampling at sites where**

- Chlorpyrifos was detected
- Other pesticides of concern to DOA and DOH are detected?
- Pesticide concentrations exceeded or were within 10 percent of Hawaii or Federal water-quality standards

## **Release results for passive samplers deployed 2015 - 2017**



# Mahalo to our Collaborators!



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# For More Information



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